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# **HATCHERY EVALUATION REPORT**

**Skamania Hatchery - Sea-run Cutthroat**

**March 1997**

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**Integrated Hatchery Operations Team (IHOT)**

# **HATCHERY EVALUATION REPORT**

## **Skamania Hatchery - Sea-run Cutthroat**

### **An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures**

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Project Number 95-2  
Contract Number 95AC49468

March 1997

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## Section 1

# Executive Summary

This report presents the findings of the independent audit of the Skamania Hatchery - Sea-run Cutthroat program. The hatchery is located on the North Fork Washougal River about 0.5 mile above the Washougal River. The Washougal River is a north bank tributary of the lower Columbia River, just downstream of Washougal, Washington. The hatchery is used for adult collection, egg incubation, and rearing of winter steelhead, summer steelhead, and sea-run cutthroat.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

### Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

### The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

## Skamania Hatchery - Sea-run Cutthroat Results

The Skamania facility includes three ponds for adult holding, 10 intermediate concrete raceways, 32 concrete raceways, and incubation facilities. Skamania Hatchery was authorized under the Mitchell Act and began operating in 1956 as part of the Columbia River Fisheries Development Program - a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The goal of the hatchery is to produce winter steelhead, summer steelhead, and sea-run cutthroat for harvest by sport anglers.

The Skamania Hatchery - Sea-run Cutthroat program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a hatchery monitoring and evaluation plan in place, needed to document adult contribution and smolt-to-adult survival, increase fry-to-smolt survival, revise its green-egg to eyed-egg survival goal, and develop a pre-spawning survival goal. The audit found that the hatchery was not in compliance with the screen approach and mesh criteria, water quality monitoring requirements, release facility requirements, temperature criteria, predation control facilities, acclimation facilities for out-of-basin releases, and pathology-free water criteria, which are all facilities requirements. The hatchery needed to develop specific incubation and rearing standards for the IHOT Operations Plan, smoltification goal, and smoltification monitoring plan. The hatchery was not meeting its loading criteria for rearing. The hatchery was not in compliance with all the alarm and food storage requirements. The hatchery needed to conduct fish contribution studies. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Skamania Hatchery - Sea-run Cutthroat program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Conduct fishery contribution studies
- Conduct IHOT QA/QC tests for feed preparation
- Construct new screens to meet approach velocity, screen mesh criteria, and active bypass
- Construct volitional release system
- Develop 450 gpm for pathogen-free water for incubation and early rearing
- Develop adult holding criteria for IHOT
- Develop approved genetics M&E plan
- Develop hatchery monitoring and evaluation plan
- Develop pre-spawning survival goal for IHOT Operations Plan
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document adult contribution
- Document smolt-to-adult survival and develop goal
- Follow IHOT requirements for checking water flow alarms daily

- Install telephone pagers
- Monitor and record DO and TGP
- Provide acclimation sites for fish released in four subbasins
- Provide bird netting on exterior raceways
- Revise green-egg to eyed-egg survival goal for IHOT Operations Plan
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

## Facility Description

|                          |  |
|--------------------------|--|
| <b>Name:</b>             | Skamania Hatchery  |
| <b>Stock/Species:</b>    | Winter Steelhead<br>Summer Steelhead<br>Sea-run Cutthroat  |
| <b>Operating Agency:</b> | Washington Department of Fish and Wildlife   |
| <b>Funding Agency:</b>   | Mitchell Act (NMFS)  |
| <b>Location:</b>         | The hatchery is located on the North Fork Washougal River about 0.5 mile above the Washougal River. The Washougal River is a north bank tributary of the lower Columbia River, just downstream of Washougal, Washington.   |
| <b>Address:</b>          | MP 39L Steelhead Road<br>Washougal, WA 98671   |
| <b>Hatchery Manager:</b> |  |
| <b>Phone:</b>            | (360) 837-3131   |
| <b>Fax:</b>              | (360) 837-3201   |
| <b>Purpose:</b>          | Skamania Hatchery was authorized under the Mitchell Act and began operating in 1956 as part of the Columbia River Fisheries Development Program - a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The goal of the hatchery is to produce winter steelhead, summer steelhead, and sea-run cutthroat for harvest by sport anglers.          |
| <b>Production Goal:</b>  | <b>Winter Steelhead</b><br><br>Produce 315,000 smolts for on-station and off-station releases.<br><br>Provide 400,000 eyed eggs to Vancouver Hatchery<br><br><b>Summer Steelhead</b><br><br>Produce 300,000 smolts for on-station and off-station releases.<br><br>Provide 400,000 eyed eggs to Beaver Creek Hatchery, 400,000 eyed eggs to Vancouver Hatchery, and 300,000 eyed eggs to Ringold Hatchery. |

## Sea-run Cutthroat

Produce 50,000 smolts for on-station and off-station releases.

### Water Supply:

Water rights total 11,670 gpm from two sources: North Fork Washougal River and Vogel Creek. The Washougal River provides most of the water used by the hatchery. Actual water use averages 9,800 gpm and ranges from 6,650 to 11,460 gpm. Vogel Creek water is used for incubation and early rearing, while Washougal River water is used thereafter until spring release.

### Facilities:

|                       |   |
|-----------------------|---|
| Adult Holding:        | 3 adult holding raceways - 5,606 cf each                              |
| Incubation:           | 84 16-tray vertical stack incubators<br>64 shallow troughs            |
| Early Rearing:        | 64 shallow troughs<br>10 circular tanks - 1,028 gal each              |
| Raceways:             | 10 intermediate raceways - 216 cf each<br>32 raceways - 1,913 cf each |
| Rearing Ponds:        | None  |
| Satellite Facilities: | None  |



## Section 3

# Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).<sup>1</sup> The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

|           |  |
|-----------|--|
| Section 1 | Performance Measures for General Information and Expenditure Information (PMs General 1-2) |
| Section 2 | Performance Measures for Program Objectives (PMs 1-4)                                      |
| Section 3 | Performance Measures for Facility Requirements (PMs 5-15)                                  |
| Section 4 | Performance Measures for Hatchery Practices (PMs 16-25)                                    |
| Section 5 | Performance Measures for Fish Health Policy (PMs 26-34)                                    |
| Section 6 | Performance Measures for Ecological Interactions (PMs 35-38)                               |
| Section 7 | Performance Measures for Genetics Policy (PMs 39-43)                                       |
| Section 8 | Blank Forms for Additional Comments.   |

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

## The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit.

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<sup>1</sup>Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

This process consisted of research and onsite visits. The site visit at the Skamania Hatchery was conducted on March 12, 1997.

The following is the five-step audit process:

1. Information was obtained from headquarters.
2. The hatchery manager was asked to fill out and return the **Audit Form**.
3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.
5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

## Compliance Status of Skamania Hatchery - Sea-run Cutthroat

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✓) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Skamania Hatchery - Sea-run Cutthroat program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

**Table 1 Summary Program Information for Skamania Hatchery - Sea-run Cutthroat**

| Component           | Location of Adult Holding, Spawning, Incubation, and Rearing |                  |             |  |  |  |
|---------------------|--|------------------|-------------|--|--|--|
|                     | Skamania Hatchery  | Cowlitz Hatchery | Area rivers |  |  |  |
| Adult Collection    | ✓  | ✓                |             |  |  |  |
| Adult Holding       | ✓  | ✓                |             |  |  |  |
| Spawning            | ✓  | ✓                |             |  |  |  |
| Fertilization       | ✓  | ✓                |             |  |  |  |
| Incubation          |  |                  |             |  |  |  |
| green-to-eyed       | ✓  |                  |             |  |  |  |
| eyed-to-hatch       | ✓  |                  |             |  |  |  |
| Rearing             |  |                  |             |  |  |  |
| fry                 | ✓  |                  |             |  |  |  |
| fingerlings         | ✓  |                  |             |  |  |  |
| smolts              | ✓  |                  |             |  |  |  |
| Acclimation/release | ✓  |                  | ✓           |  |  |  |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance  | Remedial Action Needed for Compliance                               |
|--|-------------------|-----|---|----|---|---|
|  | N/A               | Yes | ? | No |   |   |
| the hatchery programs outlined in a subbasin management plan?              |                   | ✓   |   |    | Columbia Basin System Planning Production Plan and Skamania Subbasin Plan       |   |
| ie hatchery operating under a current hatchery rational plan?              |                   | ✓   |   |    | IHOT Operations Plan and Skamania O&M Manual                                    |   |
| s it understood by staff?  |                   | ✓   |   |    |   |   |
| s it being followed?   |                   | ✓   |   |    |   |   |
| hatchery monitoring and evaluation plan in place?                          |                   |     |   |    |   |   |
| do you have a written monitoring and evaluation plan?                      |                   |     |   | ✓  | No available  | Develop hatchery monitoring and evaluation plan                     |
| ult contribution to fisheries, spawning grounds, and chery                 |                   |     |   | ✓  | No fisheries contribution data for sea-run cutthroat hatchery returns           | Document adult contribution   |
| ult pre-spawning survival as compared with blished goal                    |                   |     |   | ✓  | No goal   | Develop pre-spawning survival goal for IHOT Operations Plan         |
| take as compared with established hatchery goal                            |                   | ✓   |   |    | Review of records; in compliance 4 out of last 4 years                          |   |
| en-egg to eyed-egg survival as compared with blished goal                  |                   |     |   | ✓  | Review of records; in compliance 0 out of last 4 years. Fertilization problems. | Revise green-egg to eyed-egg survival goal for IHOT Operations Plan |
| d-egg to fry survival as compared with established l                       |                   | ✓   |   |    | Review of records; in compliance 4 out of last 4 years                          |   |
| to smolt survival as compared with established goal                        |                   | ✓   |   |    | Review of records; in compliance 3 out of last 3 years                          |   |
| duction as compared with established goal                                  |                   |     |   | ✓  | Review of records; in compliance 1 out of last 3 years                          | Increase adult returns  |
| cent survival (smolt to adult) as compared with blished goal               |                   |     |   | ✓  | No data and no goal   | Document smolt-to-adult survival and develop goal                   |
| nber of eggs, fry, fingerlings, smolts, and/or adults meet basinwide needs | ✓                 |     |   |    | Review of records/Discussion  |   |

| Description of Performance Measure                            | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance                                   |
|---|-------------------|-----|---|----|--|---|
|   | N/A               | Yes | ? | No |  |   |
| <b>Temperature</b>  |                   |     |   |    |  |   |
| Does your water temperature meet the criteria for spawning?   |                   | ✓   |   |    | Review of records/Discussion           |   |
| Does your water temperature meet the criteria for incubation? |                   |     |   | ✓  | Review of records/Discussion           | Develop 450 gpm of pathogen-free water for incubation and early rearing |
| Does your water temperature meet the criteria for rearing?    |                   |     |   | ✓  | Review of records/Discussion           | See above   |
| <b>Dissolved gases</b>  |                   |     |   |    |  |   |
| Is the oxygen level near saturation?                          |                   |     | ✓ |    | No recorded data                       | Monitor DO and record   |
| Is the dissolved nitrogen level less than saturation?         |                   |     | ✓ |    | No data                                | Monitor TGP and record  |
| <b>Chemistry</b>  |                   |     |   |    |  |   |
| Ammonia (un-ionized)  |                   |     | ✓ |    | No data                                | Run analysis  |
| Carbon Dioxide  |                   |     | ✓ |    | See above                              | See above   |
| Chlorine  |                   |     | ✓ |    | See above                              | See above   |
| H   |                   |     | ✓ |    | See above                              | See above   |
| Copper  |                   |     | ✓ |    | See above                              | See above   |
| Hydrogen Sulfide  |                   |     | ✓ |    | See above                              | See above   |
| Iron  |                   |     | ✓ |    | See above                              | See above   |
| Manganese   |                   |     | ✓ |    | See above                              | See above   |
| <b>Turbidity</b>  |                   |     |   |    |  |   |
| Does your turbidity meet the criteria?                        |                   |     | ✓ |    | No data                                | Run analysis  |

| Description of Performance Measure                     | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance                                   |
|--|-------------------|-----|---|----|--|---|
|  | N/A               | Yes | ? | No |  |   |
| <b>Alkalinity and hardness</b>                         |                   |     |   |    |  |   |
| Does your alkalinity and hardness meet the criteria?   |                   |     | ✓ |    | No data                                | Run analysis  |
| <b>Nitrite</b>   |                   |     |   |    |  |   |
| Does your nitrite meet the criteria?                   |                   |     | ✓ |    | No data                                | Run analysis  |
| <b>Pesticide Contaminants</b>                          |                   |     |   |    |  |   |
| Aldrin   |                   |     | ✓ |    | No data                                | Run analysis  |
| Dieldrin   |                   |     | ✓ |    | See above                              | See above   |
| Diieldrin  |                   |     | ✓ |    | See above                              | See above   |
| Heptachlor   |                   |     | ✓ |    | See above                              | See above   |
| Chlordane  |                   |     | ✓ |    | See above                              | See above   |
| Methoxychlor   |                   |     | ✓ |    | See above                              | See above   |
| Endane   |                   |     | ✓ |    | See above                              | See above   |
| Malathion  |                   |     | ✓ |    | See above                              | See above   |
| Parathion  |                   |     | ✓ |    | See above                              | See above   |
| <b>Disease</b>   |                   |     |   |    |  |   |
| What portions of the hatchery have disease-free water? |                   |     |   |    |  |   |
| Adult holding  |                   |     |   | ✓  | Inspection of facilities/Discussion    | None  |
| Incubation   |                   |     |   | ✓  | Inspection of facilities/Discussion    | Develop 450 gpm of pathogen-free water for incubation and early rearing |
| Early rearing  |                   |     |   | ✓  | Inspection of facilities/Discussion    | See above   |
| Rearing  |                   |     |   | ✓  | Inspection of facilities/Discussion    | None  |
| Others   | ✓                 |     |   |    |  |   |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance                         |
|--|-------------------|-----|---|----|--|---|
|  | N/A               | Yes | ? | No |  |   |
| <b>Alarm Systems</b>   |                   |     |   |    |  |   |
| Do the following areas have alarms?  |                   |     |   |    |  |   |
| Intake   |                   | ✓   |   |    | Inspection of facilities/Discussion    |   |
| Large rearing ponds and adult holding ponds                                    |                   | ✓   |   |    | Inspection of facilities/Discussion    |   |
| Raceway headboxes and rearing ponds  |                   | ✓   |   |    | Inspection of facilities/Discussion    |   |
| Incubation facilities  |                   | ✓   |   |    | Inspection of facilities/Discussion    |   |
| Quarantine areas and facilities  | ✓                 |     |   |    | No quarantine areas and facilities     |   |
| Water treatment systems  |                   | ✓   |   |    | Inspection of facilities/Discussion    |   |
| Security   |                   |     |   | ✓  | Inspection of facilities/Discussion    | Install security alarms                                       |
| Are there outside systems and buzzers in onsite residences?                    |                   | ✓   |   |    | Discussion                             |   |
| Are water flow alarms checked daily?   |                   |     |   | ✓  | Review of records/Discussion           | Follow IHOT requirements for checking water flow alarms daily |
| Are all other alarms checked weekly?   |                   | ✓   |   |    | Discussion                             |   |
| Is there a log of alarms for emergencies, tests, and maintenance requirements? |                   | ✓   |   |    | Review of records/Discussion           |   |
| Are telephone pagers used?   |                   |     |   | ✓  | Discussion                             | Install telephone pagers                                      |
| <b>Adult collection and holding facilities</b>                                 |                   |     |   |    |  |   |
| Do you meet the adult holding criteria?  |                   |     | ✓ |    | Review of records/Discussion           | Develop IHOT criteria for adult holding                       |

| Description of Performance Measure  | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|---|-------------------|-----|---|----|--|---------------------------------------|
|   | N/A               | Yes | ? | No |  |                                       |
| <b>abation facilities</b><br><br>Type 1: <u>Vertical stack</u><br>Do you have an adequate number of units for the verall program? |                   | ✓   |   |    | Inspection of facilities/Discussion    |                                       |
| Type 2: <u>Shallow troughs</u><br>Do you have an adequate number of units for the verall program?                                 |                   | ✓   |   |    | Inspection of facilities/Discussion    |                                       |
| <b>ring facilities</b><br><br>Type 1: <u>Shallow troughs</u><br>Do you have an adequate number of units for the verall program?   |                   | ✓   |   |    | Inspection of facilities/Discussion    |                                       |
| Type 2: <u>Fiberglass circular tanks</u><br>Do you have an adequate number of units for the verall program?                       |                   | ✓   |   |    | Inspection of facilities/Discussion    |                                       |
| Type 3: <u>Raceways</u><br>Do you have an adequate number of units for the verall program?  |                   | ✓   |   |    | Inspection of facilities/Discussion    |                                       |
| Type 4: <u>Intermediate raceways</u><br>Do you have an adequate number of units for the verall program?                           |                   | ✓   |   |    | Inspection of facilities/Discussion    |                                       |



| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance  |
|--|-------------------|-----|---|----|--|--|
|  | N/A               | Yes | ? | No |  |  |
| <b>Screening facilities</b>  |                   |     |   |    |  |  |
| Do you meet the approach velocity criteria?  |                   |     |   | ✓  | Inspection of facilities/Discussion    | Construct new screens to meet approach velocity, screen mesh criteria, and active bypass |
| Are the fish screens regularly cleaned?  |                   | ✓   |   |    | Inspection of facilities/Discussion    |  |
| Does the screen mesh meet screen opening criteria?   |                   |     |   | ✓  | Inspection of facilities/Discussion    | See above  |
| Are rearing containers double screened for fish that should not be released to adjacent water? | ✓                 |     |   |    | Released on station                    |  |
| <b>Predator control facilities</b>   |                   |     |   |    |  |  |
| Are your predation control facilities effective?   |                   |     |   | ✓  | Inspection of facilities/Discussion    | Provide bird netting on exterior raceways  |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance  | Remedial Action Needed for Compliance         |
|--|-------------------|-----|---|----|---|---|
|  | N/A               | Yes | ? | No |   |   |
| <b>d storage facilities and quality control</b>  |                   |     |   |    |   |   |
| Does the storage of dry/semi-moist/moist foods (dry<12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations? |                   | ✓   |   |    | Inspection of facilities/Discussion   |   |
| Does a regional quality control officer oversee production procedures and monitor:   |                   |     |   |    |   |   |
| Verification by feed manufacturer that ingredients meet specifications?  |                   |     |   | ✓  | Discussion  | Conduct IHOT QA/QC tests for feed preparation |
| Ensure feed does not contain unwanted drugs or other additives?  |                   |     |   | ✓  | Discussion  | See above                                     |
| Analyze ingredients contained in the final food product to ensure that feed specifications have been met?                                    |                   |     |   | ✓  | Discussion  | See above                                     |
| Are the foods stored and handled according to the following criteria?  |                   |     |   |    |   |   |
| Moist pellets should not exceed 10 °F at point of delivery.  |                   | ✓   |   |    | Discussion  |   |
| Moist pellets should be removed from freezer just prior to feeding.  |                   | ✓   |   |    | Discussion  |   |
| Do not leave buckets of feed or feed containers outside exposed to light or heat.  |                   | ✓   |   |    | Discussion  |   |
| Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.   |                   | ✓   |   |    | Discussion  |   |
| Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).                    |                   |     |   | ✓  | Demand feeders not insulated; manage feed supply to avoid excessive temperature | None  |

| Description of Performance Measure  | Compliance Status |            |   |    | Basis for Compliance or Non-Compliance                | Remedial Action Needed for Compliance |
|---|-------------------|------------|---|----|---|---------------------------------------|
|   | N/A               | Yes        | ? | No |   |                                       |
| <b>Release facilities</b><br><br>Do the release facilities ensure that fish are not subjected to adverse conditions?  |                   |            |   | ✓  | Inspection of facilities/Discussion                   | Construct volitional release system   |
| <b>Pollution abatement facilities</b><br><br>Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?<br><br>Are pollution abatement facilities operated correctly? |                   | ✓<br><br>✓ |   |    | Inspection of facilities/Discussion<br><br>Discussion |                                       |
| <b>Transportation facilities</b><br><br>Are the transport systems adequate to meet IHOT performance measures for transportation practices?  |                   | ✓          |   |    | Inspection of facilities/Discussion                   |                                       |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance                | Remedial Action Needed for Compliance                              |
|--|-------------------|-----|---|----|---|--|
|  | N/A               | Yes | ? | No |   |  |
| <b>Broodstock selection practices</b>  |                   |     |   |    |   |  |
| Is the donor selection process document attached? (PM #40a)  | ✓                 |     |   |    | Existing program; does not apply                      |  |
| Was the donor selection outline followed in selecting the hatchery broodstock? (PM #40b-c)                 | ✓                 |     |   |    | Existing program; does not apply                      |  |
| <b>Spawning practices</b>  |                   |     |   |    |   |  |
| Were the appropriate number of spawners, male/female ratios, and fertilization protocols used? (PM #42c-g) |                   | ✓   |   |    | Review of records/Discussion                          |  |
| <b>Incubation practices</b>  |                   |     |   |    |   |  |
| Are specific incubation standards listed in the hatchery operations plan?                                  |                   | ✓   |   |    | Reviewed IHOT Operations Plan and Hatchery O&M Manual | Develop specific incubation standards for the IHOT Operations Plan |
| Are incubation practices written?  |                   | ✓   |   |    | See above   |  |
| Incubation Type 1: <u>Vertical tray</u> (see PM #8) do you meet the loading and flow criteria?             |                   |     | ✓ |    | Review of records/Discussion                          | Develop IHOT criteria for CTT incubation                           |
| Incubation Type 2: <u>Shallow trough</u> (see PM #8) do you meet the loading and flow criteria?            |                   |     | ✓ |    | Review of records/Discussion                          | See above  |

| Description of Performance Measure                                 | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance                | Remedial Action Needed for Compliance                                   |
|--|-------------------|-----|---|----|---|---|
|  | N/A               | Yes | ? | No |   |   |
| <b>Rearing practices</b>   |                   |     |   |    |   |   |
| specific rearing standards listed in the hatchery operations plan? |                   | ✓   |   |    | Reviewed IHOT Operations Plan and Hatchery O&M Manual | Develop specific rearing standards for the IHOT Operations Plan         |
| rearing practices written?   |                   | ✓   |   |    | See above   |   |
| Rearing Unit Type 1: <u>Shallow troughs</u> (see PM #9)            |                   |     |   |    |   |   |
| Do you meet the density and DI criteria?                           |                   |     |   | ✓  | IHN losses force higher densities                     | Develop 450 gpm of pathogen-free water for incubation and early rearing |
| Do you meet the Loading and FI criteria?                           |                   | ✓   |   |    |   |   |
| Rearing Unit Type 2: <u>Circular tanks</u> (see PM #9)             |                   |     |   |    |   |   |
| Do you meet the density and DI criteria?                           |                   |     |   | ✓  | Review of records/Discussion                          | Develop 450 gpm of pathogen-free water for incubation and early rearing |
| Do you meet the Loading and FI criteria?                           |                   |     |   | ✓  | Review of records/Discussion                          | See above   |
| Rearing Unit Type 3: <u>Raceways</u> (see PM #9)                   |                   |     |   |    |   |   |
| Do you meet the density and DI criteria?                           |                   | ✓   |   |    | Review of records/Discussion                          |   |
| Do you meet the Loading and FI criteria?                           |                   | ✓   |   |    | Review of records/Discussion                          |   |
| Rearing Unit Type 4: <u>Intermediate raceways</u> (see PM #9)      |                   |     |   |    |   |   |
| Do you meet the density and DI criteria?                           |                   | ✓   |   |    | Review of records/Discussion                          |   |
| Do you meet the Loading and FI criteria?                           |                   | ✓   |   |    | Review of records/Discussion                          |   |
| <b>Smolt quality</b>   |                   |     |   |    |   |   |
| Do you produce a high quality smolt?                               |                   | ✓   |   |    | Discussion  |   |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <b>Health management practices</b>   |                   |     |   |    |  |                                       |
| Are the monthly hatchery monitoring visits being conducted? (PM #26)                             |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Are the annual broodstock inspections being conducted? (PM #27)                                  |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Is there pathogen-free water (PM #5h) and are the sanitation procedures being followed? (PM #28) |                   |     |   | ✓  | Review of records/Discussion           | See PM #5h                            |
| Are the following water quality parameters within criteria? (PM #5a-5g)                          |                   |     |   |    |  |                                       |
| Water temperature  |                   |     |   | ✓  | Review of records/Discussion           | See PM #5a                            |
| Dissolved gases  |                   |     | ✓ |    | Review of records/Discussion           | See PM #5b                            |
| Chemistry  |                   |     | ✓ |    | Review of records/Discussion           | See PM #5c                            |
| Turbidity  |                   |     | ✓ |    | Review of records/Discussion           | See PM #5d                            |
| Alkalinity and hardness  |                   |     | ✓ |    | Review of records/Discussion           | See PM #5e                            |
| Nitrite  |                   |     | ✓ |    | Review of records/Discussion           | See PM #5f                            |
| Contaminants   |                   |     | ✓ |    | Review of records/Discussion           | See PM #5g                            |
| Are rearing standards being followed? (PM #19)   |                   |     |   | ✓  | Review of records/Discussion           | See PM #19                            |
| Are egg and fish transfer/release requirements met? (PM #31)                                     |                   | ✓   |   |    | Review of records/Discussion           |                                       |

| Description of Performance Measure  | Compliance Status |     |   |        | Basis for Compliance or Non-Compliance                | Remedial Action Needed for Compliance  |
|---|-------------------|-----|---|--------|---|--|
|   | N/A               | Yes | ? | No     |   |  |
| <p><b>s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?</b></p> <p><b>cent smoltification</b></p> <p>Do you measure percent smoltification?</p> <p>Do you have a smoltification goal</p> <p>Did you meet the smoltification criteria?</p> |                   |     | ✓ | ✓<br>✓ | <p>Discussion</p> <p>Discussion</p> <p>Discussion</p> | <p>Develop smoltification goal and monitor</p> <p>See above</p> <p>See above</p> |
| <p><b>ring density (prior to release)</b></p> <p>Did you meet the rearing density criteria just prior to release?</p>   |                   | ✓   |   |        | Review of records/Discussion                          |  |
| <p><b>ease condition (at release)</b></p> <p>Did you meet all disease regulations just prior to release?</p>  |                   | ✓   |   |        | Review of records/Discussion                          |  |
| <p><b>nber (at release)</b></p> <p>Did you meet the release number goal?</p>  |                   |     |   | ✓      | Review of records/Discussion                          | Improve adult returns  |
| <p><b>size at release</b></p> <p>Did you meet the size goal?</p>  |                   | ✓   |   |        | Review of records/Discussion                          |  |
| <p><b>es of release</b></p> <p>Did you meet the release date goal?</p>  |                   | ✓   |   |        | Review of records/Discussion                          |  |
| <p><b>ation of release</b></p> <p>Did you release the fish at the specified location?</p>   |                   | ✓   |   |        | Review of records/Discussion                          |  |
| <p><b>fish reared in the subbasin or acclimated in the basin?</b></p> <p>Are the fish reared in the subbasin?</p> <p>Are the fish acclimated in the subbasin?</p>   |                   | ✓   |   | ✓      | <p>Discussion</p> <p>Discussion</p>                   | Provide acclimation sites for fish released in four subbasin                     |
| <p><b>ie release strategy appropriate for the program?</b></p>  |                   |     |   | ✓      | Discussion  | Provide acclimation sites for fish released in four subbasin. See also PM #13    |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <b>Transportation facilities</b>   |                   |     |   |    |  |                                       |
| Do transportation equipment and personnel receive disinfection before and after use?   |                   | ✓   |   |    | Discussion                             |                                       |
| Is the fish tank interior disinfected using a solution of 100 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)? |                   | ✓   |   |    | Discussion                             |                                       |
| Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?                     |                   | ✓   |   |    | Discussion                             |                                       |
| Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?   |                   | ✓   |   |    | Discussion                             |                                       |
| Is other equipment disinfected including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment using one of the following solutions?                    |                   | ✓   |   |    | Discussion                             |                                       |
| 200 ppm chlorine for 30 minutes<br>600 ppm quaternary ammonia compound for 30 minutes<br>200 ppm iodophor solution for 10 minutes  |                   | ✓   |   |    | Discussion                             |                                       |
| Do personnel wear protective garments when handling fish eggs or cultural water?   |                   | ✓   |   |    | Discussion                             |                                       |
| Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?   |                   | ✓   |   |    | Discussion                             |                                       |
| Is a daily service inspection completed before starting pump and leaving for the day?  |                   | ✓   |   |    | Discussion                             |                                       |



| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <b>Transportation facilities</b>   |                   |     |   |    |  |                                       |
| Does the fish transport unit receive an inspection prior to loading?   |                   | ✓   |   |    | Discussion                             |                                       |
| Does a pre-loading inspection covering tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading fish in the transport unit? |                   | ✓   |   |    | Discussion                             |                                       |
| Do hauling criteria include checking the fish 45 minutes to 1 hour after loading?  |                   | ✓   |   |    | Discussion                             |                                       |
| When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?  |                   | ✓   |   |    | Discussion                             |                                       |
| Is water temperature in the transportation unit maintained within the 42-48 °F range?  |                   | ✓   |   |    | Discussion                             |                                       |
| Do fish releasing procedures include the following criteria?   |                   |     |   |    |  |                                       |
| Releasing the fish at the correct release site or into the correct water body.   |                   | ✓   |   |    | Discussion                             |                                       |
| Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.  |                   | ✓   |   |    | Discussion                             |                                       |
| The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.   |                   | ✓   |   |    | Discussion                             |                                       |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <b>Evaluation practices</b>  |                   |     |   |    |  |                                       |
| Has the hatchery conducted fishery contribution studies?   |                   |     |   |    |  |                                       |
| Determine the requirements for evaluating and improving management programs?   |                   |     |   | ✓  | Discussion                             | Conduct fishery contribution studies  |
| Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit? |                   |     |   | ✓  | Discussion                             | See above                             |
| Develop guidelines that define if the proper stocks of fish are currently being used?  |                   |     |   | ✓  | Discussion                             | See above                             |
| Determine which management units contribute to a specific fishery and the time periods of those contributions?                               |                   |     |   | ✓  | Discussion                             | See above                             |
| Determine the relative contributions of the various management units to a specific fishery over the different time periods?                  |                   |     |   | ✓  | Discussion                             | See above                             |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <b>ining practices</b>   |                   |     |   |    |  |                                       |
| Does the hatchery have a training schedule for its staff?  |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Does each staff member have a personal training plan approved by a supervisor and reviewed annually? |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Does the hatchery routinely exchange training details between other hatcheries and agencies?         |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Does the hatchery encourage and reward off-duty training of staff?                                   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Does the hatchery conduct monthly staff meetings?  |                   | ✓   |   |    | Review of records/Discussion           |                                       |

| Description of Performance Measure   | Compliance Status |  |   |    | Basis for Compliance or Non-Compliance   | Remedial Action Needed for Compliance |
|--|-------------------|--|---|----|--|---------------------------------------|
|  | N/A               | Yes  | ? | No |  |                                       |
| <b>monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?</b><br><br>Conduct visit at least monthly<br><br>Monitoring conducted by qualified fish health specialist<br><br>Examine a representative sample of healthy and moribund fish from each lot.<br><br>Review fish culture practices with hatchery manager.<br><br>Report finding and results of necropsies on standard form.<br><br>Recommend appropriate drug or chemical treatment.<br><br>Summarize fish health status or stock prior to release or transfer to another facility. |                   | ✓<br><br>✓<br><br>✓<br><br>✓<br><br>✓<br><br>✓ |   |    | Review of records/Discussion<br><br>Review of records/Discussion<br><br>Review of records/Discussion<br><br>Review of records/Discussion<br><br>Review of records/Discussion<br><br>Review of records/Discussion |                                       |
| <b>all of the functions of the hatchery yearly monitoring visits being completed as described below?</b><br><br>Annually examine each broodstock for the presence of reportable viral pathogens.<br><br>Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i> .<br><br>Conduct inspection by or under the supervision of qualified fish health specialist.  |                   | ✓<br><br>✓<br><br>✓                            |   |    | Review of records/Discussion<br><br>Review of records/Discussion<br><br>Review of records/Discussion   |                                       |

| Description of Performance Measure  | Compliance Status |     |   |  | Basis for Compliance or Non-Compliance   | Remedial Action Needed for Compliance  |
|---|-------------------|-----|---|--|--|--|
|   | N/A               | Yes | ? | No   |  |  |
| <p><b>Are hatchery sanitation procedures accepted?</b></p> <p>Are there any sources of pathogen-free water, especially for incubation and early rearing?</p> <p>Are the hatchery sanitation procedures understood and being followed as described below?</p> <p>Disinfect/water harden eggs in iodophor?</p> <p>Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?</p> <p>Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?</p> <p>Is equipment used to collect dead fish sanitized prior to its use in another pond and/or lot of fish?</p> <p>Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?</p> <p>Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?</p> <p>Are dead fish properly disposed of?</p> |                   |     |   | <p>✓</p> <p></p> <p></p> <p></p> <p></p> <p></p> <p></p> <p></p> | <p>Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> <p>Inspection of facilities/Discussion</p> | <p>Provide 450 gpm of pathogen-free water for incubation and early rearing</p> |

| Description of Performance Measure  | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|---|-------------------|-----|---|----|--|---------------------------------------|
|   | N/A               | Yes | ? | No |  |                                       |
| <b>water quality parameters being followed?</b>                               |                   |     |   |    |  |                                       |
| Are the following water quality parameters within criteria? (PM #5a-5g)       |                   |     |   |    |  |                                       |
| Water temperature   |                   |     | ✓ | ✓  | Review of records/Discussion           | See PM #5a                            |
| Dissolved gases   |                   |     | ✓ |    | Review of records/Discussion           | See PM #5b                            |
| Chemistry   |                   |     | ✓ |    | Review of records/Discussion           | See PM #5c                            |
| Turbidity   |                   |     | ✓ |    | Review of records/Discussion           | See PM #5d                            |
| Alkalinity and hardness   |                   |     | ✓ |    | Review of records/Discussion           | See PM #5e                            |
| Nitrite   |                   |     | ✓ |    | Review of records/Discussion           | See PM #5f                            |
| Contaminants  |                   |     | ✓ |    | Review of records/Discussion           | See PM #5g                            |
| io to PM #21  |                   |     |   |    |  |                                       |
| <b>incubation and rearing standards being followed?</b>                       |                   |     |   |    |  |                                       |
| Are the incubation practices following the IHOT incubation criteria? (PM #18) |                   |     |   | ✓  | Review of records/Discussion           | See PM #18                            |
| Are the rearing practices following the IHOT criteria? (PM #19)               |                   |     |   | ✓  | Review of records/Discussion           | See PM #19                            |
| io to rearing practices PM #18-PM #19   |                   |     |   |    |  |                                       |
| <b>egg and fish transfer/release requirements met?</b>                        |                   | ✓   |   |    | Discussion                             |                                       |

| Description of Performance Measure  | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|---|-------------------|-----|---|----|--|---------------------------------------|
|   | N/A               | Yes | ? | No |  |                                       |
| <p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Refer to subbasin plan PM #1</p>              |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| <p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Refer to operational plan PM #2</p>        |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| <p>Is hatchery monitoring and evaluation plan in place?</p> <p>Refer to hatchery monitoring and evaluation plan PM #3</p> |                   |     |   | ✓  | Review of records/Discussion           | See PM #3                             |

| Description of Performance Measure  | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|---|-------------------|-----|---|----|--|---------------------------------------|
|   | N/A               | Yes | ? | No |  |                                       |
| Does the hatchery program meet requirements established in the regional hatchery policies and basin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, spawning and egg-take protocols? |                   |     |   |    |  |                                       |
| Does the hatchery program meet the requirements for the following?  |                   |     |   |    |  |                                       |
| Species protocols (PM #1)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Stock protocols (PM #1)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Broodstock collection location protocols (PM #41b for existing program; PM #39b for new program )   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Broodstock numbers protocols (PM #42c)  |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Broodstock collection strategy protocols (PM #41b-d for existing program; PM 39b-f for new program)   |                   |     |   | ✓  | Review of records/Discussion           | See PM #41                            |
| Spawning protocols (PM #42d-e)  |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Egg-take protocols (PM #42f-g)  |                   | ✓   |   |    | Review of records/Discussion           |                                       |



| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <p><b>Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the subbasin and hatchery plans for the following areas:</b></p> <p><b>Percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?</b></p> |                   |     |   |    |  |                                       |
| Percent smoltification (PM #22a1)  |                   |     |   | ✓  | Review of records/Discussion           | See PM #22a1                          |
| Rearing density (PM #22a2)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Disease condition (PM #22a3)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Number at release (PM #22a4)   |                   |     |   | ✓  | Review of records/Discussion           | See PM #22a4                          |
| Size at release (PM #22a5)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Date of release (PM #22a6)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| Location of release (PM #22a7)   |                   | ✓   |   |    | Review of records/Discussion           |                                       |
| <p><b>Are fish reared in the subbasin or acclimated in the subbasin?</b></p> <p>PM #22b</p>  |                   |     |   | ✓  | Discussion                             | See PM #22b                           |
| <p><b>Is the release strategy appropriate for the program?</b></p> <p>PM #22c</p>  |                   |     |   | ✓  | Discussion                             | See PM #22c                           |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| <b>new programs, has a broodstock collection plan developed?</b>   |                   |     |   |    |  |                                       |
| Is the broodstock collection plan written?   | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| For a non-captive broodstock program:  | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| Was an unbiased, representative sample collected?  |                   |     |   |    |  |                                       |
| Was the recommended number of broodstock collected?  | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| For a captive broodstock program:  |                   |     |   |    |  |                                       |
| Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program? | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| Were full-sib crosses avoided?   | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| Is the broodstock collection plan understood and being followed by staff?  | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| <b>a new program, was the donor selection outline followed in selecting the hatchery broodstock?</b>                 |                   |     |   |    |  |                                       |
| Is a donor selection plan written?   | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| Was the donor selection outline followed in selecting the broodstock?  | ✓                 |     |   |    | Existing Program; does not apply       |                                       |
| Was the target stock recommended in the donor selection process actually used?                                       | ✓                 |     |   |    | Existing Program; does not apply       |                                       |

| Description of Performance Measure  | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|---|-------------------|-----|---|----|--|---------------------------------------|
|   | N/A               | Yes | ? | No |  |                                       |
| existing programs, were the broodstock collection cedures followed?                           |                   |     |   |    |  |                                       |
| Is the broodstock collection plan written?  |                   | ✓   |   |    | Review broodstock collection plan      |                                       |
| Does the broodstock collection plan follow the guideline:                                     |                   |     |   |    |  |                                       |
| Was an unbiased, representative sample collected?   |                   | ✓   |   |    | Discussion                             |                                       |
| Was the recommended number of broodstock collected?   |                   |     |   | ✓  | Discussion                             | Increase adult returns                |
| Were the broodstock collection procedures in hatchery operation plan understood and followed? |                   | ✓   |   |    | Discussion                             |                                       |

| Description of Performance Measure  | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|---|-------------------|-----|---|----|--|---------------------------------------|
|   | N/A               | Yes | ? | No |  |                                       |
| Is the appropriate number of spawners, male/female ratio, and fertilization protocols used?                                       |                   |     |   |    |  |                                       |
| Are the spawning protocols written?   |                   | ✓   |   |    | Review of spawning protocols           |                                       |
| Are daily or weekly spawning logs available?  |                   | ✓   |   |    | Review of records                      |                                       |
| Was the appropriate number of spawners used?  |                   | ✓   |   |    | Discussion                             |                                       |
| Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?               |                   | ✓   |   |    | Discussion                             |                                       |
| Was the sex-ratio within the limits given in the performance standards?   |                   | ✓   |   |    | Discussion                             |                                       |
| Were the fertilization protocols followed?  |                   | ✓   |   |    | Discussion                             |                                       |
| If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross? |                   | ✓   |   |    | Discussion                             |                                       |

| Description of Performance Measure   | Compliance Status |     |   |    | Basis for Compliance or Non-Compliance | Remedial Action Needed for Compliance |
|--|-------------------|-----|---|----|--|---------------------------------------|
|  | N/A               | Yes | ? | No |  |                                       |
| Where a genetics monitoring and evaluation program is available?   |                   |     |   | ✓  | None provided                          | Develop approved genetics M&E plan    |
| Does the plan address the following elements listed in HOT:  |                   |     |   |    |  |                                       |
| Does the program have elements needed to meet evaluation goals 1-4?  |                   |     |   | ✓  | Discussion                             | See above                             |
| Has a qualified geneticist reviewed and endorsed the program (goal 5)?   |                   |     |   | ✓  | Discussion                             | See above                             |
| Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)? |                   |     |   | ✓  | Discussion                             | See above                             |
| Is the program understood and followed by staff?   |                   |     |   | ✓  | Discussion                             | See above                             |

## Section 4

# Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

**The Five Types of Remedial Actions**

| Type | Description  |
|------|--|
| 1    | Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery |
| 2    | Remedial actions requiring changes in agency policies or procedures  |
| 3    | Remedial actions requiring changes in monitoring coverage or interval  |
| 4    | Remedial actions requiring significant capital expenditures  |
| 5    | Remedial actions that may require significant capital expenditures but are not clearly definable at this time          |

### Remedial Actions at Skamania Hatchery - Sea-run Cutthroat

This section presents the corrective actions required to bring the Skamania Hatchery - Sea-run Cutthroat program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ( $\pm 40\%$ ).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

**Table 3. Remedial Actions Required at Skamania Hatchery - Sea-run Cutthroat**

| Remedial Action Required   | Cost | PMs <sup>1</sup> |
|--|------|------------------|
| <b>Type 1</b> - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery |      |                  |
| Increase adult returns   |      | 4g, 22a4, 41     |
| Install security alarms  | ---- | 6                |
| <b>Type 2</b> - Remedial actions requiring changes in agency policies or procedures  |      |                  |
| Develop hatchery monitoring and evaluation plan  | ---- | 3                |
| Document adult contribution  | ---- | 4a               |
| Develop pre-spawning survival goal for IHOT Operations Plan  | ---- | 4b               |
| Revise green-egg to eyed-egg survival goal for IHOT Operations Plan  |      | 4d               |
| Document smolt-to-adult survival and develop goal  | ---- | 4h               |
| Follow IHOT requirements for checking water flow alarms daily  | ---- | 6                |
| Develop adult holding criteria for IHOT  | ---- | 7                |
| Conduct IHOT QA/QC tests for feed preparation  | ---- | 12               |
| Develop specific incubation and rearing standards for the IHOT Operations Plan   | ---- | 18-19            |
| Develop smoltification goal and monitor  | ---- | 22a1             |
| Conduct fishery contribution studies   | ---- | 24               |
| Develop approved genetics M&E plan   | ---- | 43               |

<sup>1</sup> PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

| Remedial Action Required  | Cost        | PMs <sup>1</sup> |
|---|-------------|------------------|
| <b>Type 3</b> - Remedial actions requiring changes in monitoring coverage or interval   |             |                  |
| Monitor and record DO and TGP   | ----        | 5b               |
| Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants                       | ----        | 5c-5g            |
| <b>Type 4</b> - Remedial actions requiring significant capital expenditures   |             |                  |
| Develop 450 gpm for pathogen-free water for incubation and early rearing  | \$300,000   | 5a, 5h, 19, 28   |
| Install telephone pagers  | \$5,000     | 6                |
| Construct new screens to meet approach velocity, screen mesh criteria, and active bypass                                      | \$500,000   | 10               |
| Provide bird netting on exterior raceways   | \$45,000    | 11               |
| Construct volitional release system   | \$100,000   | 13               |
| Provide acclimation sites for fish released in four subbasins   | 5.0 million | 22b, 22c         |
| <b>Type 5</b> - Remedial actions that may require significant capital expenditures but are not clearly definable at this time |             |                  |
| None  | ----        |                  |

<sup>1</sup> PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.



## Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Skamania Hatchery - Sea-run Cutthroat program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

**Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:  
Skamania Hatchery - Sea-run Cutthroat**

| <b>Year</b> | <b>Fisheries<sup>1</sup><br/>(Broodyear)</b> | <b>Spawning<br/>Grounds<sup>1</sup><br/>(Broodyear)</b> | <b>Hatchery<sup>1</sup><br/>(Broodyear)</b> | <b>Total<br/>Combined<br/>Contribution<sup>2</sup><br/>(Broodyear)</b> | <b>Smolt to Adult<br/>Survival<br/>(percent)</b> |
|-------------|--|---|---|--|--|
| 1984        |  |   |   |  |  |
| 1985        |  |   |   |  |  |
| 1986        |  |   |   |  |  |
| 1987        | Complete<br>information not<br>provided      | Complete<br>information not<br>provided                 | Complete<br>information not<br>provided     | Complete<br>information not<br>provided                                | Complete<br>information not<br>provided          |
| 1988        | Complete<br>information not<br>provided      | Complete<br>information not<br>provided                 | Complete<br>information not<br>provided     | Complete<br>information not<br>provided                                | Complete<br>information not<br>provided          |
| 1989        | Complete<br>information not<br>provided      | Complete<br>information not<br>provided                 | Complete<br>information not<br>provided     | Complete<br>information not<br>provided                                | Complete<br>information not<br>provided          |
| 1990        | Complete<br>information not<br>provided      | Complete<br>information not<br>provided                 | Complete<br>information not<br>provided     | Complete<br>information not<br>provided                                | Complete<br>information not<br>provided          |
| 1991        |  |   |   |  |  |
| 1992        |  |   |   |  |  |

<sup>1</sup> Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

<sup>2</sup> Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

## Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Skamania Hatchery - Sea-run Cutthroat program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Table 5a).

**Table 5. Annual Operating Expenses: Skamania Hatchery - Sea-run Cutthroat**

| Hatchery                   | 1994           | 1995            | 1996            |
|----------------------------|----------------|-----------------|-----------------|
| 1. Skamania Hatchery       | \$9,397        | \$39,456        | \$61,316        |
| 2.                         |                |                 |                 |
| 3.                         |                |                 |                 |
| 4.                         |                |                 |                 |
| 5.                         |                |                 |                 |
| <b>Total Program Costs</b> | <b>\$9,397</b> | <b>\$39,456</b> | <b>\$61,316</b> |

The total expenditures for the Skamania Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Table 6a, 6b, and 6c).

**Table 6. Annual Operating Expenses - Skamania Hatchery**

| Program                     | 1994             | 1995             | 1996             |
|-----------------------------|------------------|------------------|------------------|
| 1. Winter Steelhead         | \$169,733        | \$164,557        | \$172,871        |
| 2. Summer Steelhead         | \$192,389        | \$174,015        | \$161,794        |
| 3. Sea-run Cutthroat        | \$9,397          | \$39,456         | \$61,316         |
| 4.                          |                  |                  |                  |
| 5.                          |                  |                  |                  |
| <b>Total Hatchery Costs</b> | <b>\$371,408</b> | <b>\$378,293</b> | <b>\$395,585</b> |

**Table 5a. Annual Operating Expenses: Skamania Hatchery - Sea-run Cutthroat**  
**Expenditure Occurring at Skamania Hatchery**

| <b>Component</b>                   | <b>1994</b>      | <b>1995</b>      | <b>1996</b>      |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs                    | \$127,403        | \$130,212        | \$135,600        |
| Operational Costs                  | \$130,460        | \$130,080        | \$139,640        |
| Capital Costs                      | \$95,000         | \$95,000         | \$95,000         |
| Indirect Costs                     | \$81,878         | \$86,335         | \$88,678         |
| Lumped Hatchery Costs <sup>1</sup> |                  |                  |                  |
| Lumped Third-Party Costs           |                  |                  |                  |
| <b>Total Hatchery Costs</b>        | <b>\$371,408</b> | <b>\$378,293</b> | <b>\$395,585</b> |
| <b>Source of Funds</b>             |                  |                  |                  |
| NMFS                               | <b>100%</b>      | <b>100%</b>      | <b>100%</b>      |
|                                    |                  |                  |                  |
| Program Production (lb)            | 27,83            | 9,375            | 18,533           |
| Total Production (lb)              | 109,943          | 89,858           | 119,812          |
| Program as Percent of Total        | 2.53%            | 10.43%           | 15.5%            |
| <b>Program Costs</b>               | <b>\$9,397</b>   | <b>\$39,456</b>  | <b>\$61,316</b>  |

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6a. Detailed Expenditures at Skamania Hatchery by Program**

**Winter Steelhead**

| <b>Component</b>                   | <b>1994</b>      | <b>1995</b>      | <b>1996</b>      |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs                    | \$127,403        | \$130,212        | \$135,600        |
| Operational Costs                  | \$130,460        | \$130,080        | \$139,640        |
| Capital Costs                      | \$95,000         | \$95,000         | \$95,000         |
| Indirect Costs                     | \$81,878         | \$86,335         | \$88,678         |
| Lumped Hatchery Costs <sup>1</sup> |                  |                  |                  |
| Lumped Third-Party Costs           |                  |                  |                  |
| <b>Total Hatchery Costs</b>        | <b>\$371,408</b> | <b>\$378,293</b> | <b>\$395,585</b> |
| <b>Source of Funds</b>             |                  |                  |                  |
| NMFS                               | <b>100%</b>      | <b>100%</b>      | <b>100%</b>      |
|                                    |                  |                  |                  |
| Program Production (lb)            | 50,247           | 39,132           | 52,330           |
| Total Production (lb)              | 109,943          | 89,858           | 119,812          |
| Program as Percent of Total        | 45.7%            | 43.5%            | 43.7%            |
| <b>Program Costs</b>               | <b>\$169,733</b> | <b>\$164,557</b> | <b>\$172,871</b> |

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6b. Detailed Expenditures at Skamania Hatchery by Program**

**Summer Steelhead**

| <b>Component</b>                   | <b>1994</b>      | <b>1995</b>      | <b>1996</b>      |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs                    | \$127,403        | \$130,212        | \$135,600        |
| Operational Costs                  | \$130,460        | \$130,080        | \$139,640        |
| Capital Costs                      | \$95,000         | \$95,000         | \$95,000         |
| Indirect Costs                     | \$81,878         | \$86,335         | \$88,678         |
| Lumped Hatchery Costs <sup>1</sup> |                  |                  |                  |
| Lumped Third-Party Costs           |                  |                  |                  |
| <b>Total Hatchery Costs</b>        | <b>\$371,408</b> | <b>\$378,293</b> | <b>\$395,585</b> |
| <b>Source of Funds</b>             |                  |                  |                  |
| NMFS                               | <b>100%</b>      | <b>100%</b>      | <b>100%</b>      |
|                                    |                  |                  |                  |
| Program Production (lb)            | 56,913           | 41,351           | 48,949           |
| Total Production (lb)              | 109,943          | 89,858           | 119,812          |
| Program as Percent of Total        | 51.8%            | 46.0%            | 40.9%            |
| <b>Program Costs</b>               | <b>\$192,389</b> | <b>\$174,015</b> | <b>\$161,794</b> |

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6c. Detailed Expenditures at Skamania Hatchery by Program**

**Sea-run Cutthroat**

| <b>Component</b>                   | <b>1994</b>      | <b>1995</b>      | <b>1996</b>      |
|------------------------------------|------------------|------------------|------------------|
| Personnel Costs                    | \$127,403        | \$130,212        | \$135,600        |
| Operational Costs                  | \$130,460        | \$130,080        | \$139,640        |
| Capital Costs                      | \$95,000         | \$95,000         | \$95,000         |
| Indirect Costs                     | \$81,878         | \$86,335         | \$88,678         |
| Lumped Hatchery Costs <sup>1</sup> |                  |                  |                  |
| Lumped Third-Party Costs           |                  |                  |                  |
| <b>Total Hatchery Costs</b>        | <b>\$371,408</b> | <b>\$378,293</b> | <b>\$395,585</b> |
| <b>Source of Funds</b>             |                  |                  |                  |
| NMFS                               | <b>100%</b>      | <b>100%</b>      | <b>100%</b>      |
|                                    |                  |                  |                  |
| Program Production (lb)            | 27,83            | 9,375            | 18,533           |
| Total Production (lb)              | 109,943          | 89,858           | 119,812          |
| Program as Percent of Total        | 2.53%            | 10.43%           | 15.5%            |
| <b>Program Costs</b>               | <b>\$9,397</b>   | <b>\$39,456</b>  | <b>\$6,1316</b>  |

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.